

What is claimed:

1. A pulley pressure control system for a transmission comprising a variable pitch pulley including movable and fixed disks applied a pressing force or an elastic force generated to be variably press-controlled by a compressing device, and an endless belt movably held between said movable disk and said fixed disk, said pulley pressure control system comprising;

a compound compressing device including a superposing pressing end that receives the amount of displacement caused by both a primary compressing device and a secondary compressing device responsive to two instructions, and an individual pressing end that receives the amount of non-superposed-displacement caused by either said primary compressing device or said secondary compressing device, or two individual pressing ends that receive the amounts of displacement caused by said primary compressing device and said secondary compressing device, respectively;

an elastic device that is connected in series to said superposing pressing end or said individual pressing end;

two driving sources that are connected to said primary compressing device and said secondary compressing device individually;

a control device for providing the instructions for said primary and said secondary compressing devices through each said driving source; and

a pressure application device that supplies at least said pressing force or said elastic force to the movable disk responsive to the instructions so that the amount of speed-change displacement of said movable disk and the amount of compressive displacement of said elastic device can be individually regulated by said control device

via said compound compressing device.

2. The pulley pressure control system for said transmission according to claim 1, wherein, in said compound compressing device, each of said two compressing devices is interconnected to an operating device and a sliding device that has two sliding members and a pressing device disposed between said two sliding members.

3. The pulley pressure control system for said transmission according to claim 1, wherein said compound compressing device gives said sliding device and/or said operating device a self-locking function.

4. The pulley pressure control system for said transmission according to claim 3, wherein, in said compound compressing device, each said sliding device is formed of a ball-screw operated by a worm transmission, or a hydraulic cylinder operated by an hydraulic valve.

5. The pulley pressure control system for said transmission according to claim 2, wherein each of said two sliding devices has a rotation preventing member that is attached to one of said sliding members, and said compound compressing device slides said rotation preventing member upwardly and downwardly.

6. The pulley pressure control system for said transmission according to claim 2, wherein, in said compound compressing device, one of said two sliding devices displaces the other and, one of said two sliding devices has an individual pressing end and the other has a superposing pressing end.

7. The pulley pressure control system for said transmission according to claim 1, wherein said compound pressing device supplies said each of a primary instruction and a secondary instruction to at least two of said three sliding members composed of a

shared sliding member and the other two sliding members in said two sliding devices.

8. The pulley pressure control system for said transmission according to claim 1, wherein said control device adds the amount of speed-change displacement to the amount of compressive displacement or subtracts the amount of speed-change displacement from the amount of compressive displacement, and said compound compressing device gives the resulting amount to said superposing pressing end.

9. The pulley pressure control system for said transmission according to claim 1, wherein said control device detects and controls the pressing force, the elastic force or the semi-elastic force, using a pressure sensor that is disposed between said compound compressing device and a main body of said transmission.

10. The pulley pressure control system for said transmission according to claim 1, wherein said compound compressing device includes an engagement device comprised of two sliding members and connected in series to one of said two pressing ends so as to control supply or interruption of the pressing force transmitted on a pressing force supply path to said movable disk.

11. The pulley pressure control system for said transmission according to claim 10, wherein said compound compressing device regulates gap amount between said two sliding members so that said the gap amount becomes constant by means of one of said two pressing ends.

12. The pulley pressure control system for said transmission according to claim 10, wherein said compound compressing device presses said engagement device using said individual pressing end and presses said elastic devices using said superposing end.

13. A pulley pressure control system for a transmission comprising a variable pitch first pulley including movable and fixed disks, a variable pitch second pulley including movable and fixed disks, and an endless belt wound around said first and said second pulleys, said pulley pressure control system comprising:

a first and second pressure application devices each comprised of a compound compressing device having a superposing pressing end that receives in series the amounts of displacement caused by both a primary compressing device and a secondary compressing device responsive to two supplied instructions, and an individual pressing end that receives one of the amounts of non-superposed-displacement caused by either said primary compressing device or said secondary compressing device, or two pressing ends that receive individually the amounts of displacement caused by said primary and said secondary compressing devices, in which one of said two pressing ends forms a pressing force supply path led to said movable disk and the other forms an elastic force supply path led to said movable disk;

a switching device connected to a control device for receiving a switching instruction so that said control device can make each of said first pulley and said second pulley select the reference function or the follower function as a role of pulley function responsive to said switching instruction;

a first and second elastic devices each connected in series to said elastic force supply path of each said first and said second pressure application devices to apply the elastic force to said first and said second pulleys, respectively;

said control device, which is connected to said first and said second pressure

application devices, for supplying instructions to each said first and said second pressure application devices via two driving sources to which said two compressing devices are connected individually; and

said control device gives one of or both said first pulley and said second pulley a function of individually regulating the pressing force or the elastic force and a function of switching between roles of a reference pulley and a follower pulley, by using said both pressure application devices and said switching device.

14. The pulley pressure control system for said transmission according to claim 13, wherein said control device provides said regulating instructions and said switching instruction as electric signals to be converted to mechanical signals by said driving sources and said switching device.

15. The pulley pressure control system for said transmission according to claim 13, wherein said first and second pressure application devices are an input and an output pressure application devices which actuate an input pulley and an output pulley associated with said first and said second pulleys, respectively.

16. The pulley pressure control system for said transmission according to claim 13, wherein said switching device has another pressure supply path for only switching the function, which is formed of a driving source and a compressing device that are controlled by said control device.

17. The pulley pressure control system for said transmission according to claim 15, wherein said switching device has an input and an output engagement device each connected in series to said pressing force supply path in each said input and said output pressure application devices.

18. The pulley pressure control system for said transmission according to claim 17, wherein said control device supplies the switching instructions to both said pressure application devices so that the pressure application is performed on one of the pressing force supply paths while the pressure removal is performed on the other pressing force supply path.

19. The pulley pressure control system for said transmission according to claim 13, wherein said control device has rotation speed sensors for said first pulley and said second pulley, and switches between the transmission operations at an arbitrary speed ratio or at an output side rotation speed on said second pulley side based on a radius of said belt.

20. A pulley pressure control system for a transmission comprising an input shaft, an output shaft, a variable pitch input pulley including movable and fixed disks mounted on said input shaft, a variable pitch output pulley including movable and fixed disks mounted on said output shaft, and an endless belt wound around said input and output pulleys, said pulley pressure control system comprising:

an input side pressure application device including a primary and a secondary compressing device having a superposing pressing end that receives in series the amounts of displacement caused by said primary and said secondary compressing devices responsive to two supplied instructions and an individual pressing end that receives one of the amounts of non-superposed displacement caused by said primary and said secondary compressing devices, or two individual pressing ends that receive individually the amounts of displacement caused by said primary and secondary compressing devices, respectively, and having a pressing force supply path directly

formed by one end of said two pressing ends and an elastic force supply path indirectly formed via an input elastic member compressed in series by the other end, led to said input pulley;

an output side pressure application device including a primary and a secondary compressing device having a superposing pressing end that receives in series the amounts of displacement caused by said primary and said secondary compressing devices responsive to two supplied instructions and an individual pressing end that receives one of the amounts of non-superposed displacement caused by said primary and secondary compressing devices, or two individual pressing ends that receive individually the amounts of displacement caused by said primary and secondary compressing devices, respectively, and having a pressing force supply path directly formed by one end of said two pressing ends and an elastic force supply path indirectly formed via an output elastic member compressed in series by the other end, led to said output pulley;

a switching device for changeably selecting a role of pulley function to each said input and said output pulley and consequently supplying a reference function to one of said input and output pulleys and a follower function to the other;

a control device for supplying regulating instructions to said two compressing devices of each said pressure application device and a switching instruction to said switching device; and

each of said input and said output pressure application devices arbitrarily regulates a pressing force or an elastic force and supplies the pressing force or the elastic force to the associated pulley responsive to each instruction issued from said

control device.

21. The pulley pressure control system for said transmission according to claim 20, wherein both of said pressure application devices synchronously or asynchronously regulate a speed ratio using said individual pressing ends and torque using said superposing pressing ends.

22. The pulley pressure control system for said transmission according to claim 20, wherein said control device controls a friction force applied to said output pulley in proportion or inverse proportion to the rotation speed by the use of regulation of both said pressure application devices.

23. The pulley pressure control system for said transmission according to claim 20, wherein said control device supplies to an instruction supply path an instruction to compensate said belt or an elastic member for an error due to deterioration so as to recover the same.

24. The pulley pressure control system for said transmission according to claim 20, wherein said control device supplies to an instruction supply path an instruction to compensate the lowering of transmission efficiency in a low-speed range and/or a high-speed range.

25. The pulley pressure control system for said transmission according to claim 20, wherein said control device supplies to an instruction supply path a compensating instruction to add or to remove the pressure applied to a high-compressive elastic member when transmission starts or halts.

26. The pulley pressure control system for said transmission according to claim 20, wherein said pressure application device is disposed remotely from said movable



disk so that the pressure from said pressure application device is transmitted to said movable disk through a pressure transmitting device comprising a bearing and a transmitting means.

27. The pulley pressure control system for said transmission according to claim 20, wherein said each pressure application device is disposed said elastic device to a side of said movable disk and said compressing devices to a side of a body of said transmission.

28. The pulley pressure control system for said transmission according to claim 20, wherein in said switching device, said transmission mode selection means has four reversible motors as four driving sources, and said transmission mode selection means is capable of distinguishing the forward/reverse mode transmission switching instruction from said rotation speed/torque regulating instruction.

29. The pulley pressure control system for said transmission according to claim 20, wherein said switching device is transmission mode selection means for switching at an intermediate speed range in an entire transmittable speed range between a forward mode transmission in which said input side pressure application device performs a reference pulley function while said output side pressure application device performs a follower pulley function, and a reverse mode transmission in which said input side pressure application device performs the follower pulley function while said output side pressure application device performs the reference pulley function.

30. A pulley pressure control system for a transmission comprising an input pulley and an output pulley composed of variable pitch pulleys including movable and fixed disks, and an endless belt movably wound around said input and said output

pulleys, composed of a press-type belt or a pull-type belt, said pulley pressure control system comprising;

an input and an output pressure application device having a pressing force supply path that gives one pulley of said input and said output pulleys a reference function by applying a pressing force , and an elastic force supply path that gives the other pulley a follower function by applying an elastic force;

an input and an output elastic member applying to said input and said output pulleys the elastic force generated by being variably press-controlled in series via said input and said output pressure application devices, respectively;

a semi-elastic force supply path disposed in parallel to said pressing force supply path so as to regulate a frictional pressure applied to said movable disk of said one pulley continuously after instructions has been stopped ,with the use of a semi-elastic force that results from the simultaneously supply of the pressing force and the elastic force; and

a control device holding axial torque of both said input and said output pulleys into high transmitting efficiency in accordance with the semi-elastic force and the elastic force, individually applied to said input and said output pulleys.

31. The pulley pressure control system for said transmission according to claim 30, wherein said control device controls an amount of the semi-elastic force applied to one of said movable disks within such a range as not to change the radius of said belt predetermined by the supplied pressing force.

32. The pulley pressure control system for said transmission comprising an input pulley and an output pulley, each composed of a variable pitch pulley including movable

and fixed disks, or two movable disks connected to an input shaft and an output shaft, and an endless belt movably wound around said input and said output pulleys, composed of at least a press-type belt or a pull-type belt, said pulley pressure control system comprising;

a first input and a first output pressure application device variably control a first transmission device including a first input pulley, a first output pulley and a first belt, when one of said first input and said first output pulleys performs a rotation speed control by applying a pressing force, the other performs a torque control by applying an elastic force generated by pressing in series a first elastic member;

a second input and a second output pressure application devices variably control a second transmission device including a second input pulley, a second output pulley and a second belt, when one of said second input and said second output pulleys performs a torque control by applying an elastic force generated by pressing in series a second elastic member, the other performs a rotation speed control by applying a pressing force;

a switching device changeably selecting said first transmission device or said second transmission device responsive to a switching instruction; and

a control device supplying a switching instruction to said switching device, so that each of said pressure application devices can give a follower function by applying the elastic force to one side pulley of at least said first transmission device or said second transmission device while each said belt is put at least in a position of a large belt radius with the use of said press-type belt or in a position of a small belt radius with the use of said pull-type belt, and a reference function by applying the pressing force to the

other side pulley.

33. The pulley pressure control system for said transmission according to claim 32, wherein said first and second input pressure application devices and said first and second output pressure application devices are shared to a single input pressure application device and a single output pressure application device, each of which has a pressing force supply path and an elastic force supply path led to each said movable disk of a singly shared input pulley and a singly shared output pulley.

34. The pulley pressure control system for a transmission comprising an input shaft and an output shaft power-transmitting between both said shafts, a first pulley and a second pulley, each composed of a variable pitch pulley including movable and fixed disks or two movable disks, and an endless belt movably held between said first pulley and said second pulley, composed of a press-type belt or a pull-type belt, said pulley pressure control system comprising;

a first pressure application device which has a first compressing device, and at least a pressing force supply path for applying a pressing force not through a first elastic member or an elastic force supply path for applying an elastic force passing in series through said first elastic member, so that said first compressing device provides the pressing force and/or the elastic force to said movable disk of said first pulley;

a second pressure application device which has a second compressing device, and at least a pressing force supply path for applying a pressing force not through a second elastic member or an elastic force supply path for applying an elastic force passing in series through said second elastic member, so that said second compressing device provides the pressing force and/or the elastic force to said movable

disk of said second pulley;

a switching device changeably selecting the primary connection of said first pulley and said second pulley to said input shaft and said output shaft of said transmission, or the secondary connection of said first pulley and said second pulley to said output shaft and said input shaft of said transmission, respectively; and

a control device applying instructions for regulating the pressing force and/or the elastic force to first and second driving sources individually connected to said first and said second compressing devices and said switching instruction to said switching device.

35. The pulley pressure control system for said transmission according to claim 34, wherein said control device makes a primary transmission device based on said primary connection serve as a forward mode transmission device and makes a secondary transmission device based on said secondary connection serve as a reverse mode transmission device.

36. The pulley pressure control system for a transmission comprising a first transmission device and a second transmission device each including an input pulley and an output pulley composed of variable pitch pulleys having at least movable disk, and an endless belt composed of at least a press-type belt or a pull-type belt, said pulley pressure control system comprising;

a first input and output pressure application device for variably speed/torque-controlling said first transmission device, and giving one of said first and said second pulleys a reference function by applying a pressing force and the other a follower function by applying an elastic force generated by compressing in series a first

elastic member;

said first transmission device performing higher transmitting efficiency in a first speed ratio range of an entire speed ratio range than said second transmission device;

a second input and output pressure application device for variably speed/torque-controlling said second transmission device, and giving one of said second and said second pulleys a reference function by applying a pressing force and the other a follower function by applying an elastic force generated by compressing in series a second elastic member;

said second transmission device performing higher transmitting efficiency in a second speed ratio range of an entire speed ratio range than said first transmission device;

a switching device changeably selecting, in the alternative, said first transmission device and said second transmission device; and

a control device capable of enlarging an entire transmittable range of high transmission efficiency into more widened range in combination with said first speed ratio range in said first transmission device and said second speed ratio range in said second transmission device.

37. The pulley pressure control system for said transmission according to claim 36, wherein in said first and said second transmission devices, said input pulleys and said output pulleys are a single input pulley and a single output pulley, respectively.

38. The pulley pressure control system for said transmission according to claim 36, wherein said first and said second input and output pressure application devices are comprised of a single input pressure application device and a single output pressure

application device.